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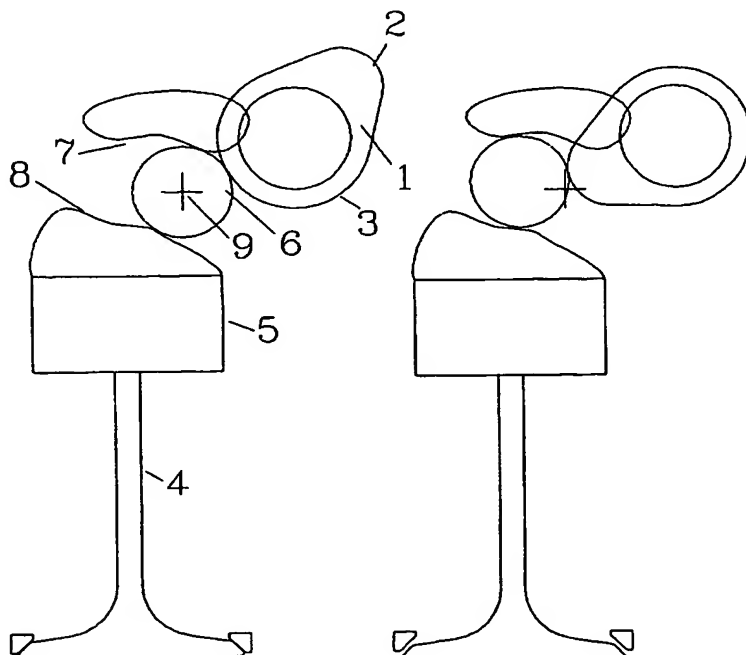
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(54) Title: VARIABLE VALVE GEAR



(57) Abstract: The invention provides a variable valve gear particularly for internal combustion engines, in which a control cam (2) of a camshaft (1) acts, by way of a free cam follower, being supported on a rotatable control surface, to a valve (4) to produce an adjustment of the valve stroke. The valve stroke can vary continuously from a maximum value to zero while the valve clearance is held unchanged. In one case the system is nothing more than a roller (6) trapped among a cam lobe, a control shaft (7) and a valve actuator (5).

AMENDED CLAIMS

received by the International Bureau on 15 February 2005: original claims 1-15 have been replaced by amended claims 1-11.

1. A variable valve gear comprising at least:
a casing;
a cam (2) mounted on a camshaft (1) for rotation therewith;
a valve (4);
a valve actuator (5) for displacing said valve (4);
an angularly displaceable, about an axis (9) of said casing, control surface (7);
a roller (6);
characterized in that:
the roller (6) is arranged among the cam (2), the control surface (7) and the valve actuator (5) in substantially simultaneous abutment with all three of them;
the roller (6) is displaced along the control surface (7) under the camming action of the cam (2);
the valve actuator (5) is displaced by the roller (6);
and the valve (4) is displaced by the valve actuator (5) at a stroke which is variable depending on the angular displacement of the control surface (7).
2. As in claim 1 characterized in that:
the roller is a substantially free roller trapped among the cam, the control surface and the valve actuator.
3. As in claim 1 characterized in that:
the roller is only partially cylindrical or it has a fraction of a solid of revolution.
4. A variable valve gear according claim 1 for operation with variable valve duration, characterized in that:
the control surface (7) comprises an initial lost motion part followed by an activation part;
the initial lost motion part substantially is a surface of revolution whose axis coincides the axis (9) about which the control surface (7) is angularly displaceable;
the axis (9) about which the control surface (7) is angularly displaceable and the axis of the roller (6) are substantially offset to each other when, with the valve (4) closed, the roller (6) is in touch to the basic circle region of the cam (2).
5. A variable valve gear according claim 1, characterized in that:
the axis (9), about which the control surface (7) is angularly displaceable, substantially coincides to the axis of the roller (6) when, with the valve (4) closed, the roller (6) is in contact to the basic circle region of the cam (2).
6. As in claim 1 characterized in that:
the control surface (7) and the surface (8) on the valve actuator (5) along which the roller (6) contacts the valve actuator (5) are plane or cylindrical.
7. A variable valve gear comprising at least:

a casing;
a cam mounted on a camshaft for rotation therewith;
a valve;
a valve actuator for displacing said valve;
an angularly displaceable, about an axis of said casing, control surface;
a roller;
a lever;
characterized in that:
the roller is mounted at one end of the lever;
the lever is swivellably coupled, at its other end, to the valve actuator, with the swivel joint being a substantially non-moving swivel joint on the valve actuator;
the roller is arranged between the cam and the control surface in substantially simultaneous abutment with both of them;
the roller is displaced along the control surface under the camming action of the cam;
the valve actuator is displaced by the roller, via the lever;
and the valve is displaced by the valve actuator at a stroke which is variable depending on the angular displacement of the control surface.

8. A variable valve gear comprising at least:

a casing;
a cam (2) mounted on a camshaft (1) for rotation therewith;
a valve (4);
a valve actuator (5) for displacing said valve (4);
an angularly displaceable, about an axis (9) of said casing, control surface (7);
a rocker (35) comprising a surface (37), the rocker (35) is pivotally mounted on said casing, the rocker (35) is driven by the cam (2) to pivot in an oscillatory manner;
a roller (6);
characterized in that:
the roller (6) is arranged among the surface (37), the control surface (7) and the valve actuator (5) in simultaneous abutment with all three of them;
the surface (37) of the rocker (35), under the camming action of the cam (2), displaces the roller (6) along the control surface (7);
the valve actuator (5) is displaced by the roller (6);
and the valve (4) is displaced by the valve actuator (5) at a stroke which is variable depending on the angular displacement of the control surface (7).

9. As in claim 8 characterized in that:

the rocker (35) is connected to a first end of a push rod (34) which has a second end which engages the cam (2).

10. A variable valve gear comprising:

a cam (2) mounted on a camshaft (1) for rotation therewith;

a cam follower (33);
a valve (4);
a valve displacing device (5) for displacing said valve (4);
a valve lever (61) swivelably coupled to said valve displacing device (5),
with the swivel joint being a substantially non-moving swivel joint on said
valve displacing device (5);
a control lever (8) rotatable about an axis (9) and swivelably coupled to said
valve lever (61) at a swivel joint (11);
an adjusting device for displacing said axis (9) along a path;
the stroke of said valve (4) is variable according to the displacement of said axis
(9) along said path;
characterized in that:
the swivel joint (11) between the valve lever (61) and the control lever (8) is
displaced by the cam indirectly through a linkage like "control cam to rocker
to swivel joint" or like "control cam to push rod to rocker to swivel joint" and
the known from the art.
11. As in claim 1 characterized in that:
the roller comprises pins and rings in order to limit the sliding on the
members it abuts, for the sake of friction reduction.

STATEMENT UNDER ARTICLE 19 (1)

The amendments have no impact on the description and the drawings as filed. The amendments were made under the light of the Search Report and the written opinion of the International Searching Authority (EPO).

In the Search Report it is mentioned that a copy of the earlier application, whose priority has been claimed, has not been furnished. The receipts (No. 06517 and No. 06518) from PCT's receiving office in Greece (OBI) do prove that the fees for furnishing the priority documents were paid before the PCT fees themselves.